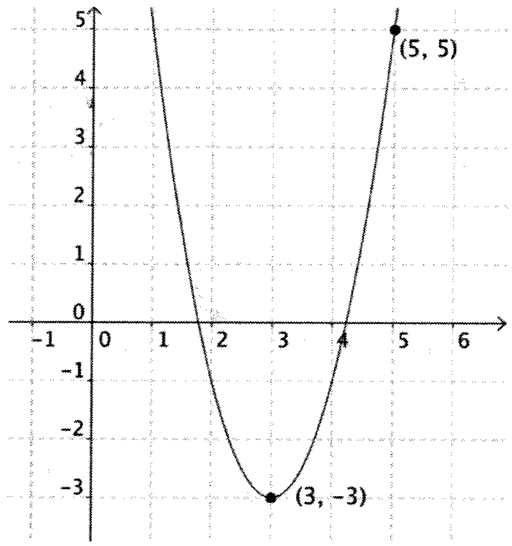
Pre-Calculus Review Problems Chap. 4 **NAME:** KEY

1. Write the equation of the parabola in standard form.



$y = a(x-3)^2 - 3$

$5 = a(5-3)^2 - 3$

$5 = a(2)^2 - 3$

$5 = 4a - 3$

$8 = 4a$

$a = 2$

Vertex Form

So, $\boxed{y = 2(x-3)^2 - 3}$

$y = 2(x-3)(x-3) - 3$

$y = 2(x^2 - 6x + 9) - 3$

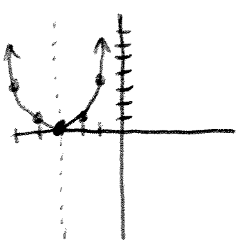
$y = 2x^2 - 12x + 18 - 3$

$\boxed{y = 2x^2 - 12x + 15}$

Standard Form

2. Given $f(x) = x^2 + 6x + 9$, find the following:

x	y
-1	4
-2	1
-3	0
-4	1
-5	4



a. Vertex. $\boxed{(-3, 0)}$

$x = \frac{-6}{2(1)} = \frac{-6}{2} = -3$ $y = (-3)^2 + 6(-3) + 9$ $y = 0$

b. x-intercept(s). $0 = x^2 + 6x + 9$

$0 = (x+3)(x+3)$

$\boxed{(-3, 0)}$

c. y-intercept(s)

$y = (0)^2 + 6(0) + 9$ $\boxed{(0, 9)}$

d. Equation for the Axis of Symmetry

$x = -3$

e. sketch the graph.

f. Domain/range

D: $(-\infty, \infty)$ or $\{x = \mathbb{R}\}$

R: $\{y \mid y \geq 0\}$ or $[0, \infty)$

g. write the interval where $f(x) \geq 0$.

$(-\infty, \infty)$

3. Rewrite the function $f(x) = -2x^2 + 4x - 6$ in vertex form. $y = a(x-h)^2 + k$

$x = \frac{-(4)}{2(-2)} = \frac{-4}{-4} = 1$

$y = -2(1)^2 + 4(1) - 6$

$y = -2 + 4 - 6$

$y = -4$

$(1, -4)$
h k

y-int: $(0, -6)$

$-6 = a(0-1)^2 - 4$

$-6 = 1a - 4$

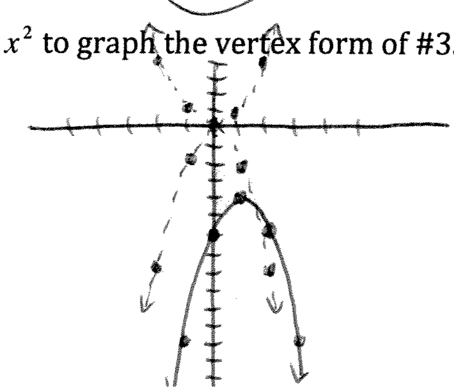
$-2 = a$

$\boxed{y = -2(x-1)^2 - 4}$

4. Use transformations of $f(x) = x^2$ to graph the vertex form of #3. Show at least 5 points.

$y = x^2$

X	Y	
-2	4	$\cdot -2 = -8$
-1	1	$\cdot -2 = -2$
0	0	$\cdot -2 = 0$
1	1	$\cdot -2 = -2$
2	4	$\cdot -2 = -8$

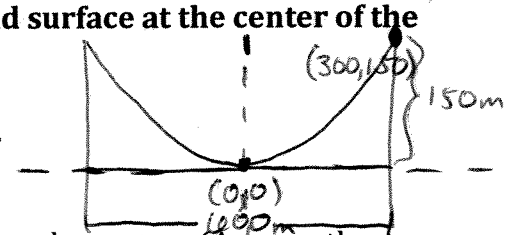


Right 1

Down 4

5. **A suspension bridge has twin towers that extend 150 meters above the road surface and are 600 meters apart. The cables are parabolic in shape and are suspended from the top of the towers. The cables touch the road surface at the center of the bridge.** $y=a(x-0)^2+0$

$150=a(300-0)^2+0$



a. Find the equation of the parabola made by the cables.

$150=300^2(a)$

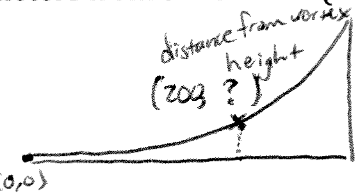
$a=\frac{150}{300^2}$

$\boxed{f(x)=\frac{150}{300^2}(x)^2}$

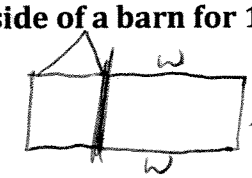
b. Find the height of the cables at a point 200 meters from the center. (Assume the road is level).

$f(200)=\frac{150}{300^2}(200)^2$

$\boxed{f(200)=66.67m}$



6. **Cruella deVil with 4000 meters of fencing needs to fence a rectangular piece of land for her stolen puppies. She is going to use the side of a barn for 1 side.**



$4000=2w+l$

$l=4000-2w$

Write an equation for the Area.

$A=l\cdot w$

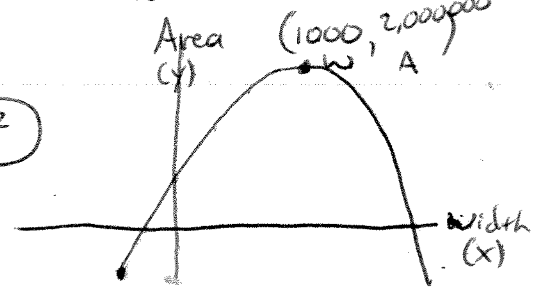
$A=(4000-2w)w$

$A=-2w^2+4000w$

What is the largest area that can be enclosed?

$x=\frac{-4000}{2(-2)}=\frac{4000}{4}=1000$

$A=-2(1000)^2+4000(1000)=2{,}000{,}000\ m^2$



What are the dimensions of the enclosure?

$\boxed{\begin{aligned}w&=1{,}000\ m\\ l&=2{,}000\ m\end{aligned}}$ ← $4000-2(1000)$

7. **Write the equation of a line in vertex form that has a vertex of (-3, 2) and passes through the point (-4, 6).**

$y=a(x-h)^2+k$

$6=a(-4+3)^2+2$

$6=a(-1)^2+2$

$4=1a$

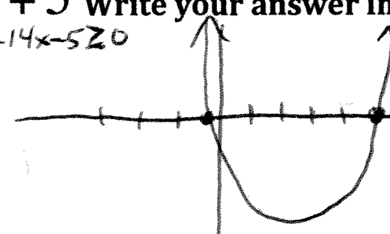
$\boxed{y=4(x+3)^2+2}$

8. **Solve the inequality** $3x^2 \geq 14x+5$ **Write your answer in interval notation.**

$3x^2-14x-5\geq 0$

x-intercepts: $(3x+1)(x-5)=0$

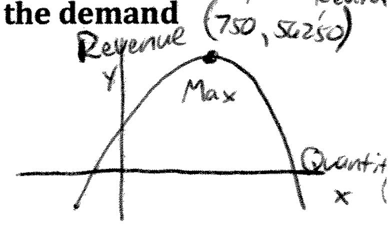
$x=-\frac{1}{3}$ $x=5$



$\boxed{(-\infty,-\frac{1}{3}]\cup[5,\infty)}$

9. **The price p (in dollars) and the quantity x sold of rubix cubes obey the demand equation:**

$$p=-\frac{1}{10}x+150$$



Vertex: $\frac{-150}{2(-\frac{1}{10})}=750$

$R(x)=xp$

a.) Express the revenue R as a function of x. $R(x)=-\frac{1}{10}x^2+150x$

b.) What is the revenue if 100 units are sold? $R(100)=\$14{,}000$

c.) What quantity x maximizes revenue? What is the maximum revenue? 750 items $56,250

d.) What price should the company charge to maximize revenue?

$p=-\frac{1}{10}(750)+150=\$75^{00}$